INSTRUCTION MANUAL

FOR

LABORATORY CENTRIFUGE

Z 320

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HERMLE

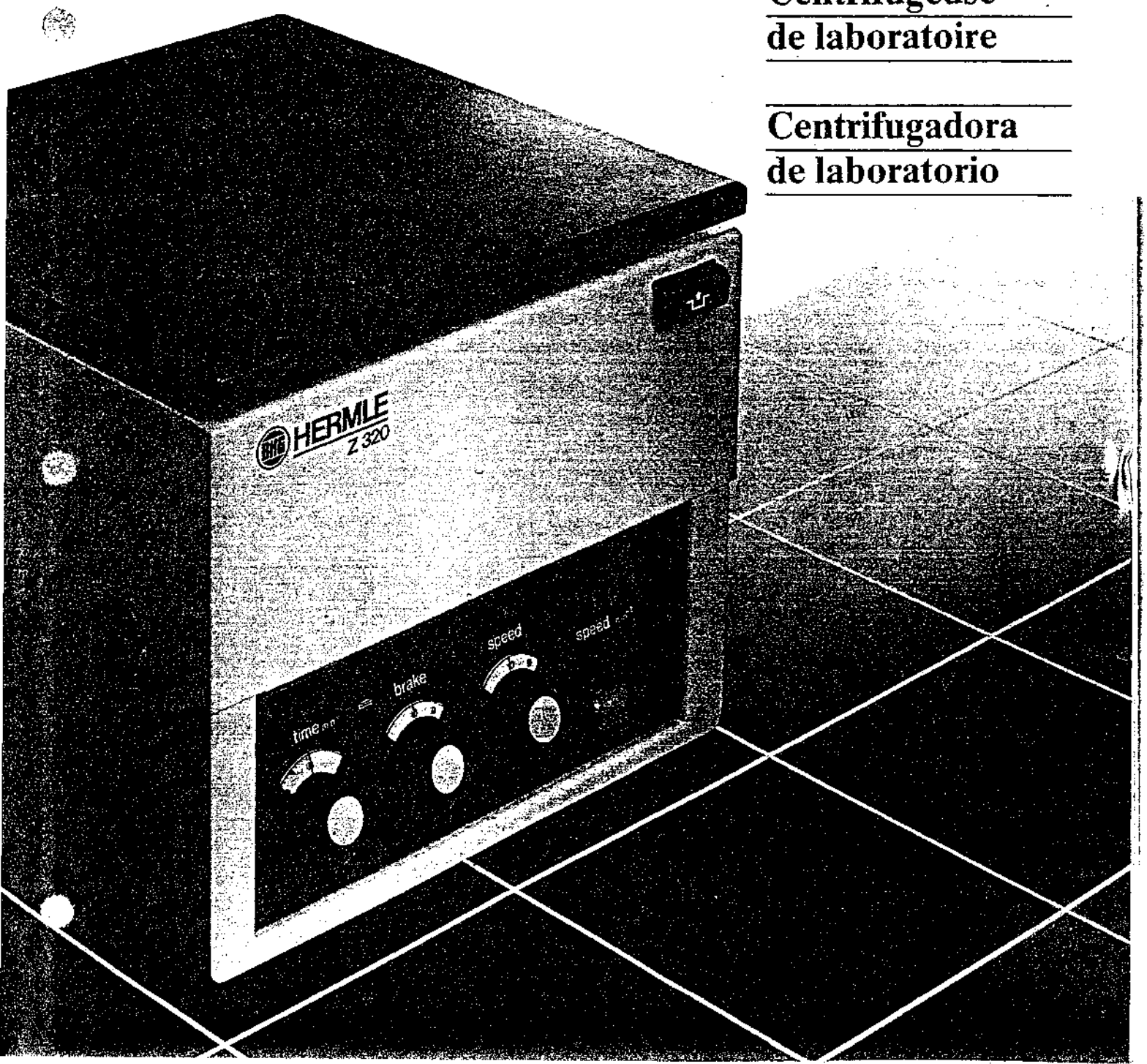
Z 320

Universal Laborzentrifuge

Laboratory centrifuge

Centrifugeuse de laboratoire

Centrifugadora de laboratorio



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1. General Information

1.1 Description

Model" Z 320* is a universal bench top centrifuge which covers many fields of application by offering a wide range of accessories. It accomodates swing out rotors up to a max. capacity of 4 x 100 ml, as well as angle rotors up to 10.000 rpm (microtiter rotor and hematocrit rotor see brochure).

1.2 Safety precautions to be observed before operating the centrifuge

Do not operate if:

- the centrifuge has not been installed correctly
- the centrifuge is partly dismantled
- service has been attempted by non-authorized or non-qualified personnel
- the rotor has not been installed securely on the motor shaft

Do not operate the centrifuge with rotors and accessories not belonging to the standard range of accessories of this centrifuge without obtaining the prior permission of the manufacturer. Exception: tubes and bottles made of glass or plastic normally available in the laboratory.

Do not operate the centrifuge in explosive atmospheres.

1.3 Safety standards

The centrifuge corresponds to the general requirements set by German law for medical apparatus, "Med GV" group 3.

The following standards have been considered for the production of our centrifuges:

- Accident prevention rules for centrifuges UVV-VBG 7z
- Accident prevention rules for electrical equipment & installations UVV-VBG 4
- DIN 58970, part 1,2 and 4 for centrifuges and centrifuge tubes
- Electrical interference suppression according to interference degree N as per VDE 0875

1.4 Technical Data

Manufacturer	BHG HERMLE GmbH & Co. Industriestrasse 8 - 12 7209 Gosheim/Fed. Rep. of Germany Tlx: 760613 bhgd, Fax: (07426)67 170	
Type No.	Z 320	
Dimensions: Width Depth Height	 390 mm 390 mm 340 mm	
Weight	29 kg	
Noise level	64 dB(A)	
max. speed max. volume max.RCF Admiss. density Admiss. kinetic energy	10.000 rpm +/- 5% 400,0 ml 6.580 x g 1,2 kg/dm³ 2.400 Nm	
Electrical connection Current Connected load	220 V/50 Hz 0,71 A 0,155 KVA	115 V/60 Hz 1,7 A 0,195 KVA
Interference suppression	interference degree N as per VDE 0875	
Service Dept. at HERMLE:	074 26 / 67-438	
Address of agent:		

1.5 Accessories supplied with each centrifuge unit

- 2 spare fuses
- 2 plastic plugs
- 1 instruction manual
- 1 warranty certificate
- 1 spanner wrench for mounting and removing the rotor
- 1 hook for mechanical lid release

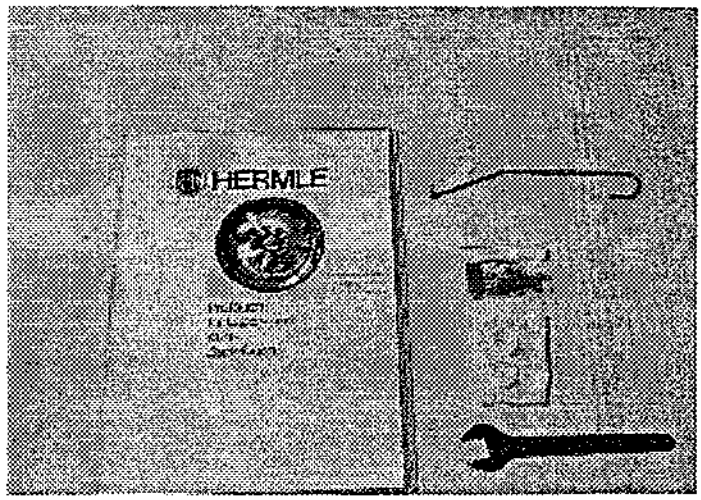


Figure 1

1.6 Warranty

The centrifuge has been subjected to thorough testing and quality control.

In the unlikely event of any manufacturing faults occuring, the centrifuge and rotors are covered by warranty for a period of 1 year from date of delivery.

This warranty becomes invalid in case of wrong operation, use of non-appropriate spare parts or accessories and non-authorized modification of rotor or centrifuge.

The manufacturer reserves the right for any technical modifications of the product in respect to technical improvement.

2. Installation

2.1 Unpacking the centrifuge

The centrifuge Z 320 is supplied in a carton protected by PU foam. Open the carton and take off the upper foam part (including the accessories) and remove the centrifuge.
The instruction manual and the accessories mentioned under 1.5 should be kept with the centrifuge.

Figure 2

2.2 Required space

The centrifuge should be installed on a rigid, even surface. The Z 320 should only be operated on a stable laboratory table/cabinet etc..

To guarantee sufficient ventilation, please ensure that the centrifuge has at least 15 cm free space around the unit.

It is recommended that the centrifuge is <u>not</u> sited in positions subject to excessive heat, e.g. strong sunlight, radiators etc. as heat-build-up can occur within the centrifuge bowl.

2.3 Installation

1. Before operating the centrifuge check that the power supply corresponds to that on the manufacturer's rating label which is mounted on the rear panel.

2. Switch on the power switch (1), the green control lamp of the power supply (1), as well as the white control lamp of the lid release (2) will light. The lid can then be opened by pressing firstly the lid release switch (2), as well as secondly the mechanical lid lock (3), (see figure 3).

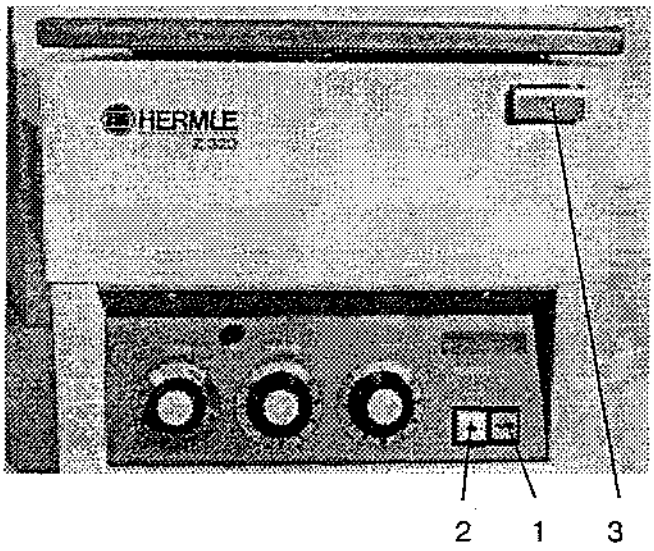


Figure 3

3. Remove the locking nut (1) on the motor shaft by turning clockwise and the transport protection out of the centrifuge bowl (2), (see figure 4).

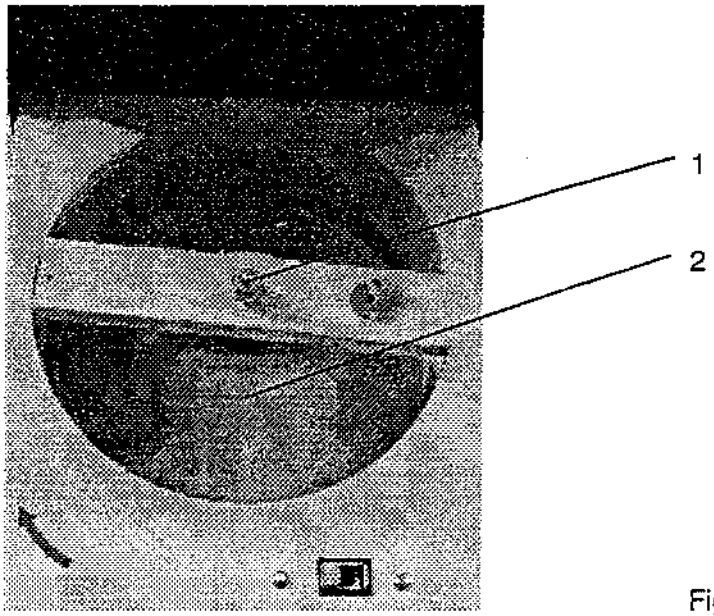


Figure 4

3. How to install and load a rotor

3.1 Mounting and securing a swing out rotor

Clean the motor shaft (3), as well as the rotor mounting hole (2) with a piece of cloth and place the rotor on the motor shaft ensuring that the pins (4) align correctly with the rotor slots (1). Secure the rotor to the shaft by turning the rotor nut counter-clockwise (see figure 5 + 6).

Figure 5

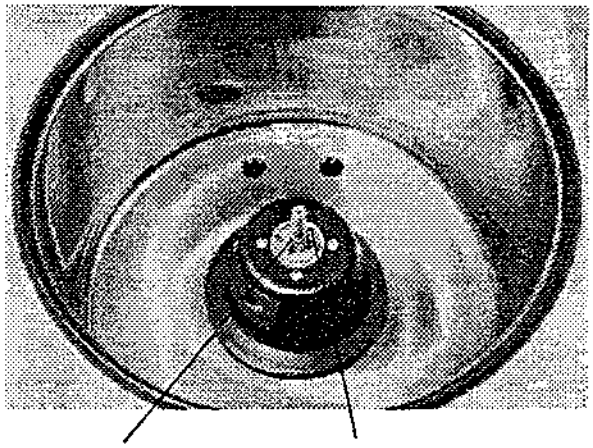
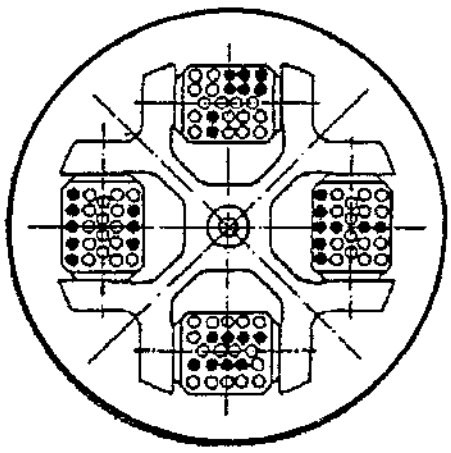
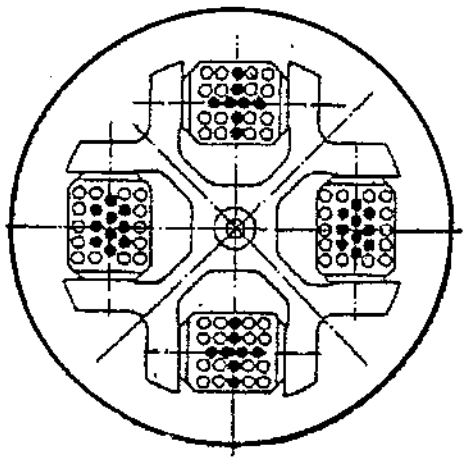


Figure 6

When loading the buckets, and tube racks, you should proceed according to the below sketch A.



incorrect



correct

It is very important to load the rotor with the complete set of buckets / tube racks. Fill the tubes equally by eye-measuring and insert them into the tube-holes, respectively tube racks. The difference in weight between the loaded buckets / tube racks should not exceed 10 grams.

It is also allowed to operate, (for example) a 4-place swing out rotor with 2 loaded and 2 unloaded buckets, but it is important that the loaded buckets are then opposite each other (see sketch A, page 7).

To remove the rotor from the shaft turn the rotor nut clockwise repeatedly until the rotor nut has lifted the rotor from its former position on the motor shaft.

3.2 Mounting and securing a micro titre plate rotor

Is same as for swing out rotors.

3.3 Mounting and securing an angle rotor

Clean the motor shaft (1) and the rotor mounting hole (2) with a piece of cloth and place the rotor on the motor shaft ensuring that the pins (3) align correctly with the rotor slots (4), (see figure 7).

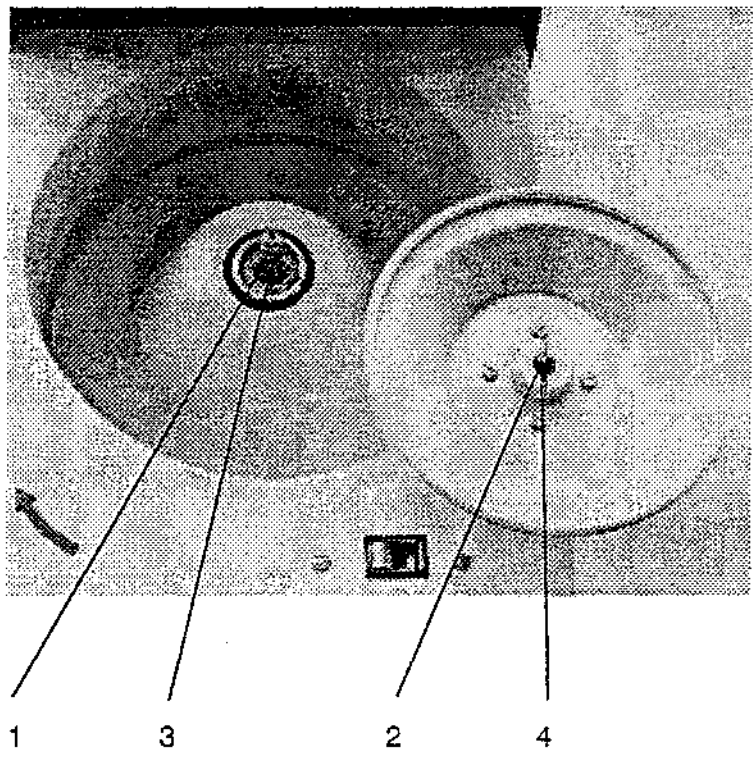


Figure 7

Secure the rotor to the shaft by turning the rotor nut (1) counter-clockwise. When doing this, hold the rotor with the other hand (see figure 8).

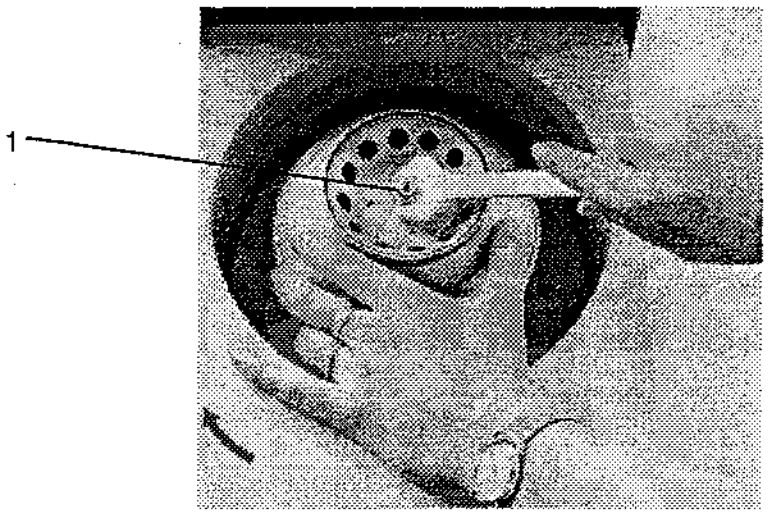


Figure 8

ATTENTION:
Before operation, secure the rotor lid to the rotor by pressing the snap connector onto the rotor nut (see figure 9).

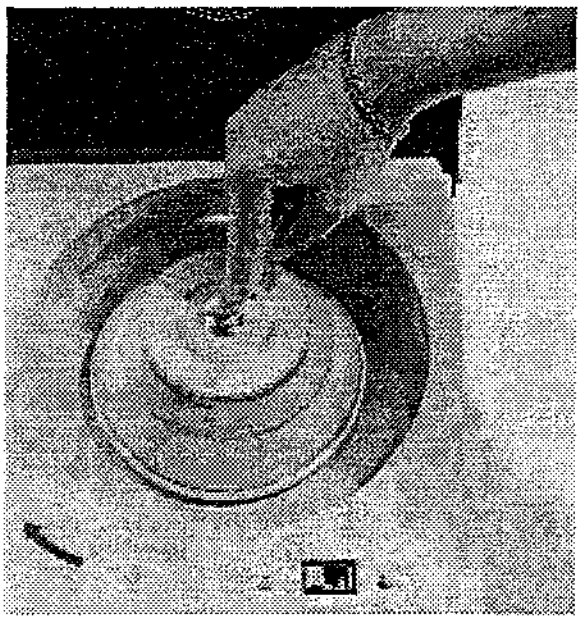
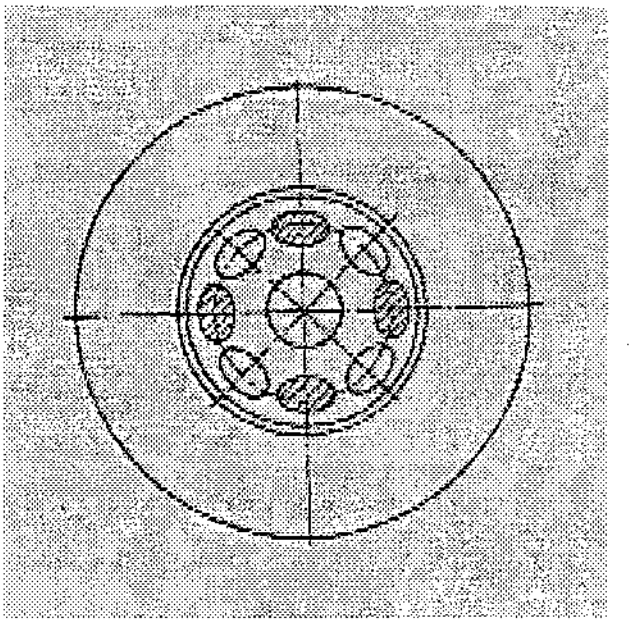


Figure 9

To remove the rotor from the motor shaft, turn the rotor nut clockwise, screw it off and take the rotor vertically off the shaft.

When loading the rotor you should proceed according to sketch B. Fill the tubes equally by eye-measuring and insert them into the tube-holes of the rotor (see sketch B).

The difference in weight between the tubes should not exceed 2 - 3 grams.



○ empty tube-holes

◉ loaded tube-holes

Sketch B

It is also allowed to operate, (for example) a 6-place rotor with 2 or 4 loaded tubes only, but it is important that the 2 occupied tube-holes are opposite each other (see sketch B).

To remove the rotor from the motor shaft, turn the rotor nut clockwise, screw it off and take the rotor vertically off the shaft.

3.4 Mounting and securing a hematocrit rotor

Clean the motor shaft (1) and the rotor mounting hole (2) with a piece of cloth and place the rotor on the motor shaft ensuring that the pins (3) align correctly with the rotor slots (4), (see figure 10).

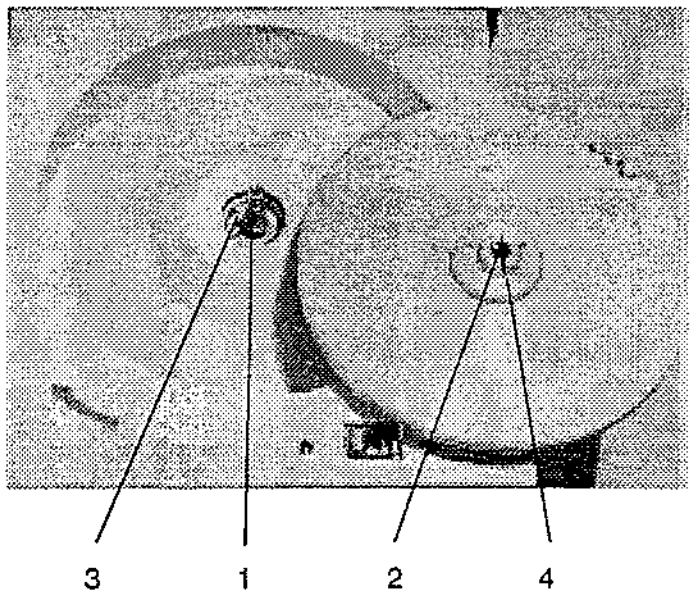


Figure 10

Secure the rotor to the shaft by turning the rotor nut (1) counter-clockwise. When doing this, hold the rotor with the other hand (see figure 11).

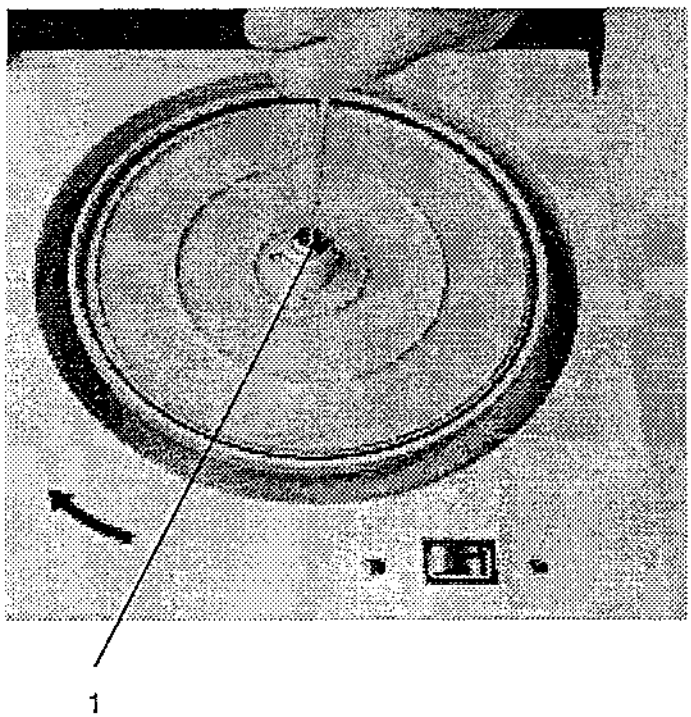


Figure 11

ATTENTION:

Before operation, secure the rotor lid to the rotor by pressing the snap connector onto the rotor nut (see figure 12).

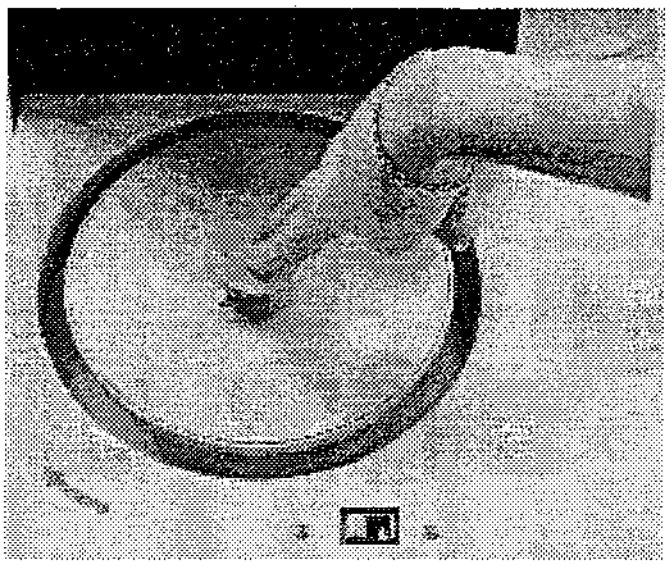


Figure 12

To install or remove the lid, press both locking bolts together (see figure 13).

To remove the rotor from the motor shaft, turn the rotor nut clockwise, screw it off and take the rotor vertically off the shaft.

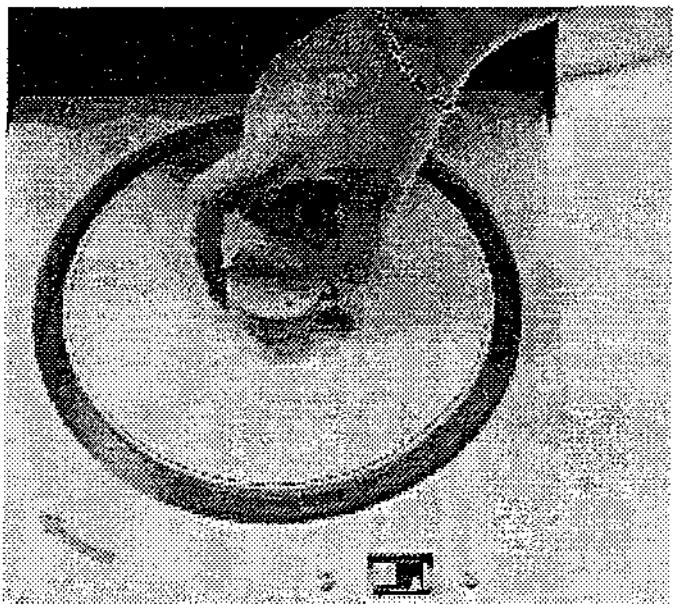


Figure 13

3.5 Overloading of rotors

The max. load permitted for a rotor, which is determined by the manufacturer, as well as the max. speed allowed with the rotor (see indications on the rotor itself) must not be exceeded.

The liquids with which the rotors are loaded should have an average homogeneous density of 1,2 g per ml or less, when the rotor is run at maximum speed.

To spin liquids of a higher density, the speed should be reduced according to the following formula:

$$\text{Reduced speed (n red.)} = \frac{1{,}2}{\text{higher density value}} \times \text{max. speed (n max.)}$$

Example: $\text{n red} = \frac{1{,}2}{1{,}7} \times 4000 = 2.823 \text{ rpm}$

In case of any questions please contact the manufacturer!

ATTENTION:

Never operate the centrifuge with rotors or buckets which show any signs of corrosion or mechanical damage.

Never operate with strongly corrosive materials which could damage rotor and buckets.

4. Operation

4.1 Power switch

The power supply switch (1) (green light), switches the centrifuge on and the control lamp of the lid release (2), as well as the digital indication of the speed (3) will light. The power switch (1) should always be the first to be switched on and the last to be switched off, (see figure 14).

4.2 Lid release

When the lid release lamp (2) is on and the rotor is stationary, the lid can be opened. To open the lid, press the lid release switch (2) of the electrical lid lock, the indicator lamp (2) will go out,and then press the lid release button (4) of the mechanical lid lock.

The lid can **only** be opened when the rotor is stationary and the white control lamp (2) lights up (lid lock according to UVV-VBG 7z).

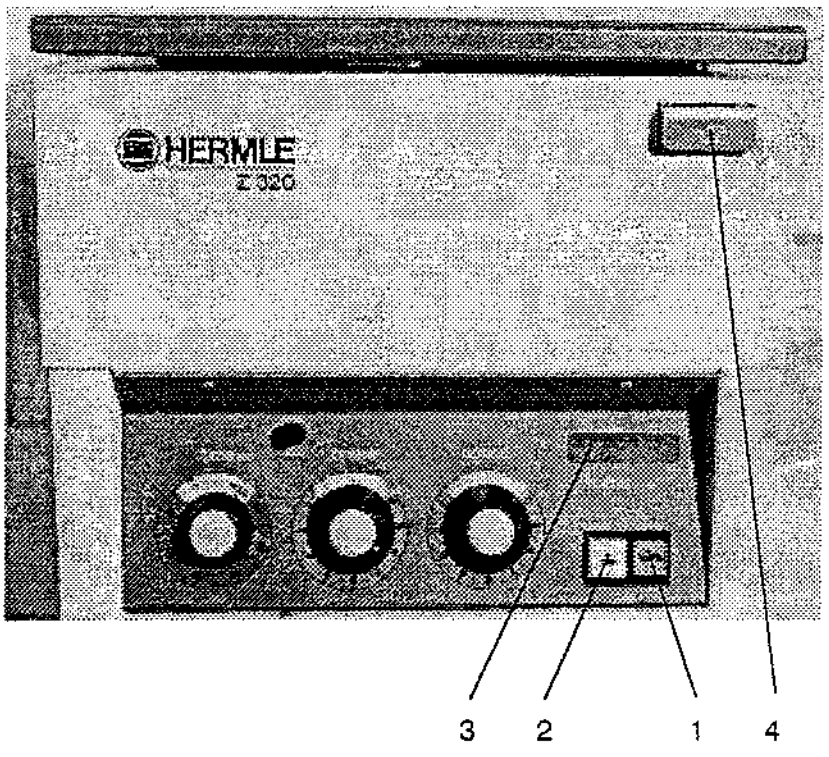


Figure 14

4.3 Rotor installation

see part 3. of the manual.

4.4 Lid lock

After correct fitting and loading of the rotor, close the lid. The white control lamp of the lid release (1) will light, indicating that the rotor is stationary and the lid closed correctly.
The centrifuge can only be started with the lid closed (lid lock according to UVV-VBG 7z).

When the rotor starts accelerating, the lid release indication (1) switches off and the lid cannot be opened, (see figure 15).

4.5 Speed preselection

The speed (rpm) can be steplessly preselected between 100 and 10.000 rpm (depending on the rotor type) with the knob SPEED (2).

Once set, the speed can be reproduced to within +/- 2%. The actual speed is indicated in steps of 100 rpm on the digital indication SPEED (3).

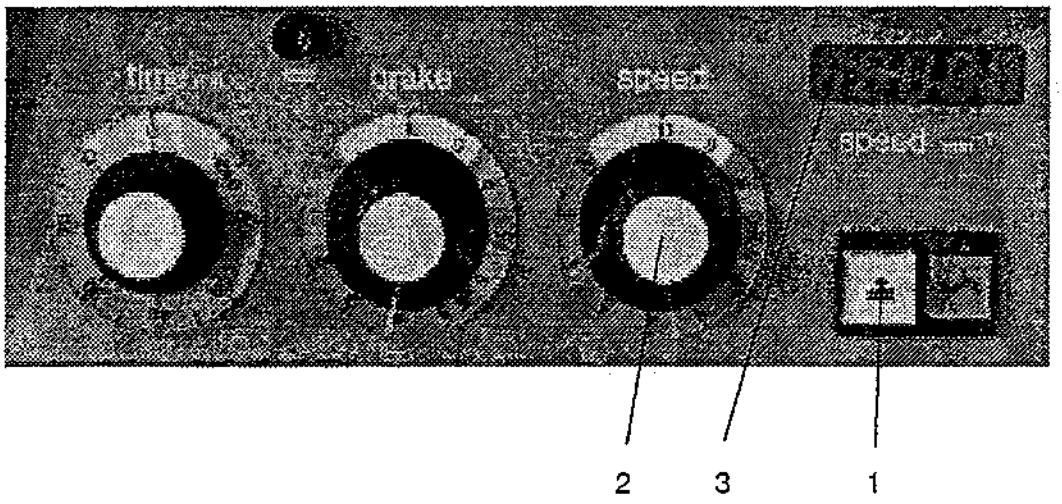


Figure 15

4.6 Preselection of operating time

Turning the timer switch (1) clockwise, sets the operating time (max. 60 mins.) and starts the centrifuge. If the required operation time is 5 minutes or less, the timer should be switched over the 30 minute position and then back to the desired value. When the set time expires, the centrifuge switches off automatically. For continuous operation, switch the knob TIME (1) to the position HOLD, (see figure 16).

4.7 Preselection of brake intensity

To reduce the risk of resuspending samples, during deceleration, it is possible to steplessly pre-select the brake intensity with the knob BRAKE (2), (see figure 16). In addition, please have a look at the acceleration and deceleration curves under point 8.1!

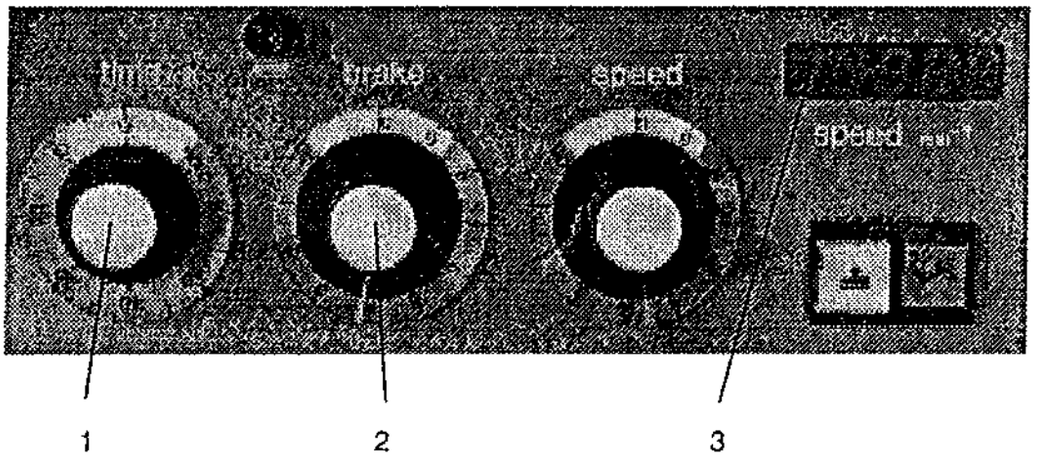


Figure 16

5. Safety facilities

5.1 Imbalance

In case of unequal loading of opposite buckets / tube racks or tube-holes, the operation is interrupted during the acceleration phase, and the centrifuge switches off. To indicate, when the digital LED speed display blinks on and off, an imbalance cut off has occured.

The centrifuge cannot be re-started until the imbalance has been corrected and the lid has been opened and re-closed.

6. Service and Maintenance

6.1 Service of centrifuge

Centrifuge service and maintenance should be done regularly and only by authorized and qualified personnel.

6.2 Cleaning the centrifuge

Always keep the centrifuge housing, rotor chamber, rotors and rotor accessories clean. The bucket insert bolts of a swing out rotor should be regularly greased. Cleaning is not merely for hygenic or aesthic purposes, but also is necessary to prevent corrosion and damage to the centrifuge.

Anodized parts such as rotors, reduction plates etc., should only be cleaned with neutral cleaning agents (pH value 6 - 8). Never use an alkaline cleaning agent (pH > 8). After cleaning ensure that all parts are dried thoroughly by hand or in a warm-air-cabinet (max. temp. + 50°C).

It is recommended that all anodized aluminium parts are regularly treated with anti-corrosion oil, so that their durability will be increased and the corrosion risk reduced.

6.3 Cleaning of centrifuge after breakage of glass tubes/glass bottles

With high g-values, there is a possibility that tube breakage will occur.

Should this happen, the centrifuge rotor and rotor chamber must be thoroughly cleaned and all broken particles must be removed immediately. If this is not done, they could scratch the protecting coat of the rotor or stick to the bucket insert bolts and hinder the buckets to swing out properly.

If the rotor chamber has not been properly cleaned, this will produce a fine black dust which can cause significant damage to the centrifuge.

6.4 Disinfection

If, due to tube breakage, infectious material contaminates the centrifuge, rotor, rotor chamber, buckets etc. should be disinfected ! ! !

Rotor and swing-out buckets must not be autoclaved.

Rotor and rotor chamber should then be treated with a neutral disinfection agent. This would be the best way to achieve a good result upon all surfaces.

7. Breakdown

7.1 Emergency lid release

In case of power failure or any malfunction, the lid can be opened manually by the following procedure:

1. Switch off the centrifuge and unplug the power cord.
2. Remove the plastic plug (1) on the left side of the housing.
3. Insert the lid release hook (2) (supplied with the centrifuge) into the hole and pull out the pin (3) by hooking the lid release hook into it before.
The lid can then be opened, (see figure 17 / sketch C).

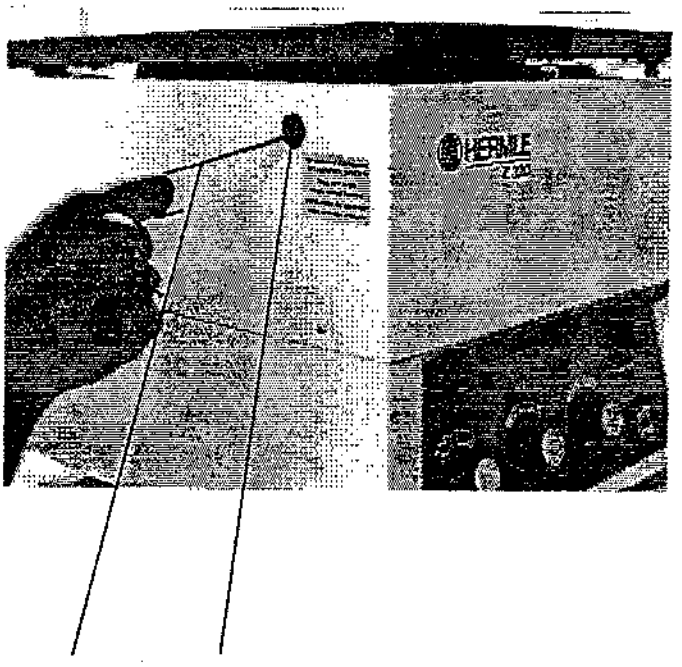
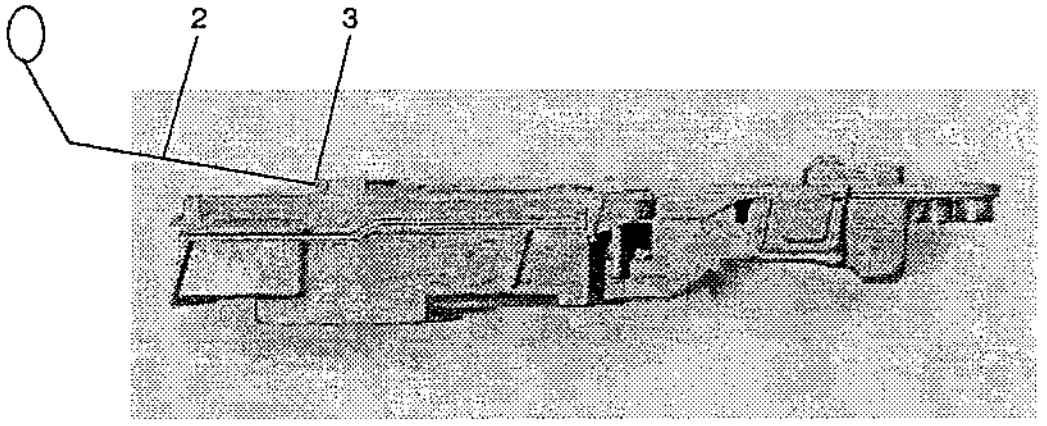


Figure 17



Sketch C

7.2 Check list / Trouble shooting

FAULT	POSSIBLE REASON	SOLUTION
Centrifuge will not start - no indication on front panel.	No power supply. Defective fuse.	Check mains (power) and centrifuge fuses. Replace if necessary.
Lid cannot be released.	Defective lid lock.	Open manually (see 7.1)
	Lid lock is jammed.	Re-adjust lid lock.
	No power from PC board.	Call service.
Centrifuge cannot be started, although power is on.	Lid not closed correctly (white indicator lamp does not light).	Close lid correctly.
	No speed or time preselected.	Check and set the time.
	Fuse on front panel is defective.	Check fuses and replace if necessary.

8. Nomograms

8.1 Acceleration and deceleration values of the Z 320

8.2 RCF - (g-value) - diagrams

9. Appendix

9.1 Chart for determining g-values

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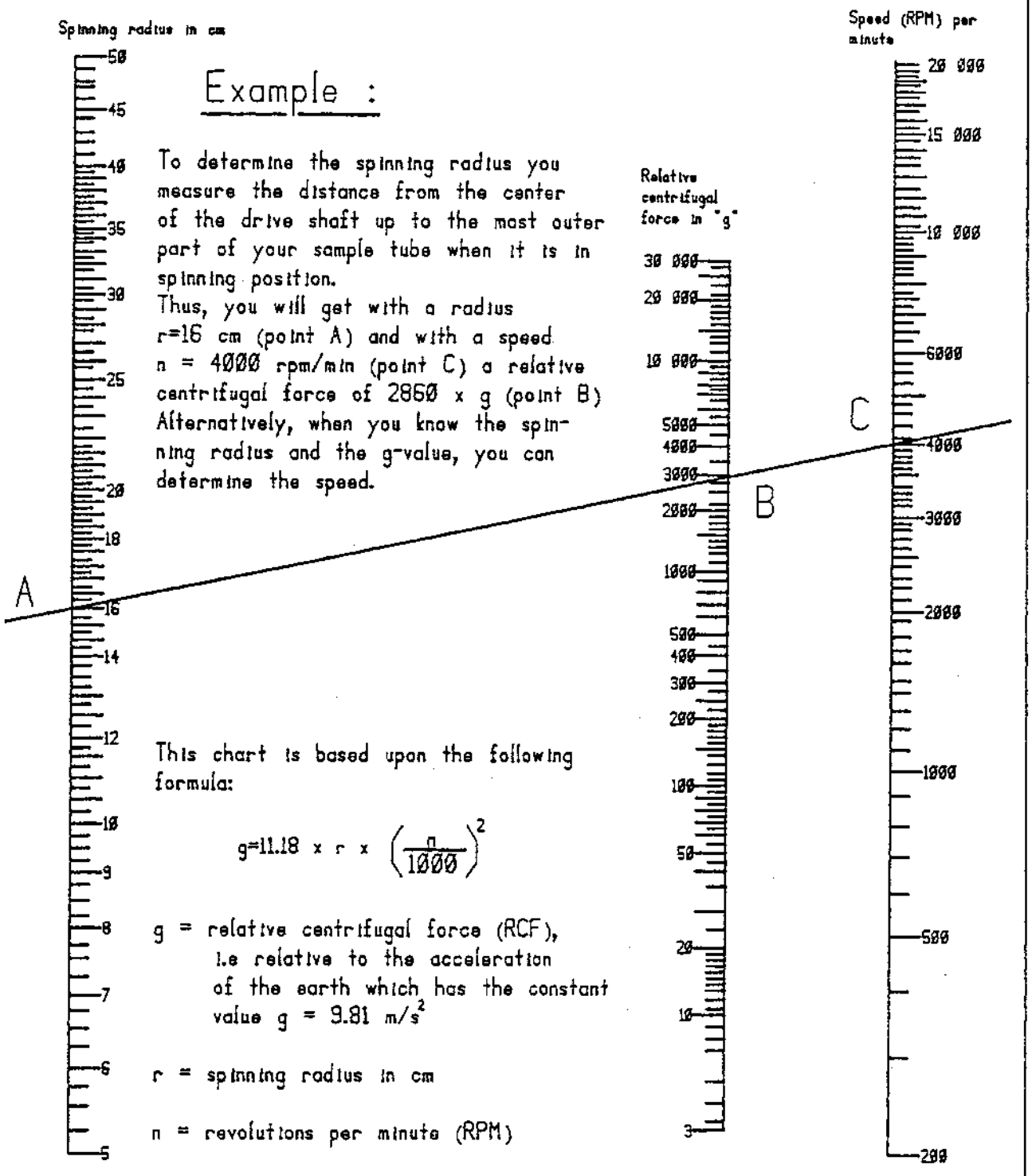
C H A R T

For the Determination of the g - Value



Example :

To determine the spinning radius you measure the distance from the center of the drive shaft up to the most outer part of your sample tube when it is in spinning position.
Thus, you will get with a radius r=16 cm (point A) and with a speed n = 4000 rpm/min (point C) a relative centrifugal force of 2860 x g (point B)
Alternatively, when you know the spinning radius and the g-value, you can determine the speed.

This chart is based upon the following formula:

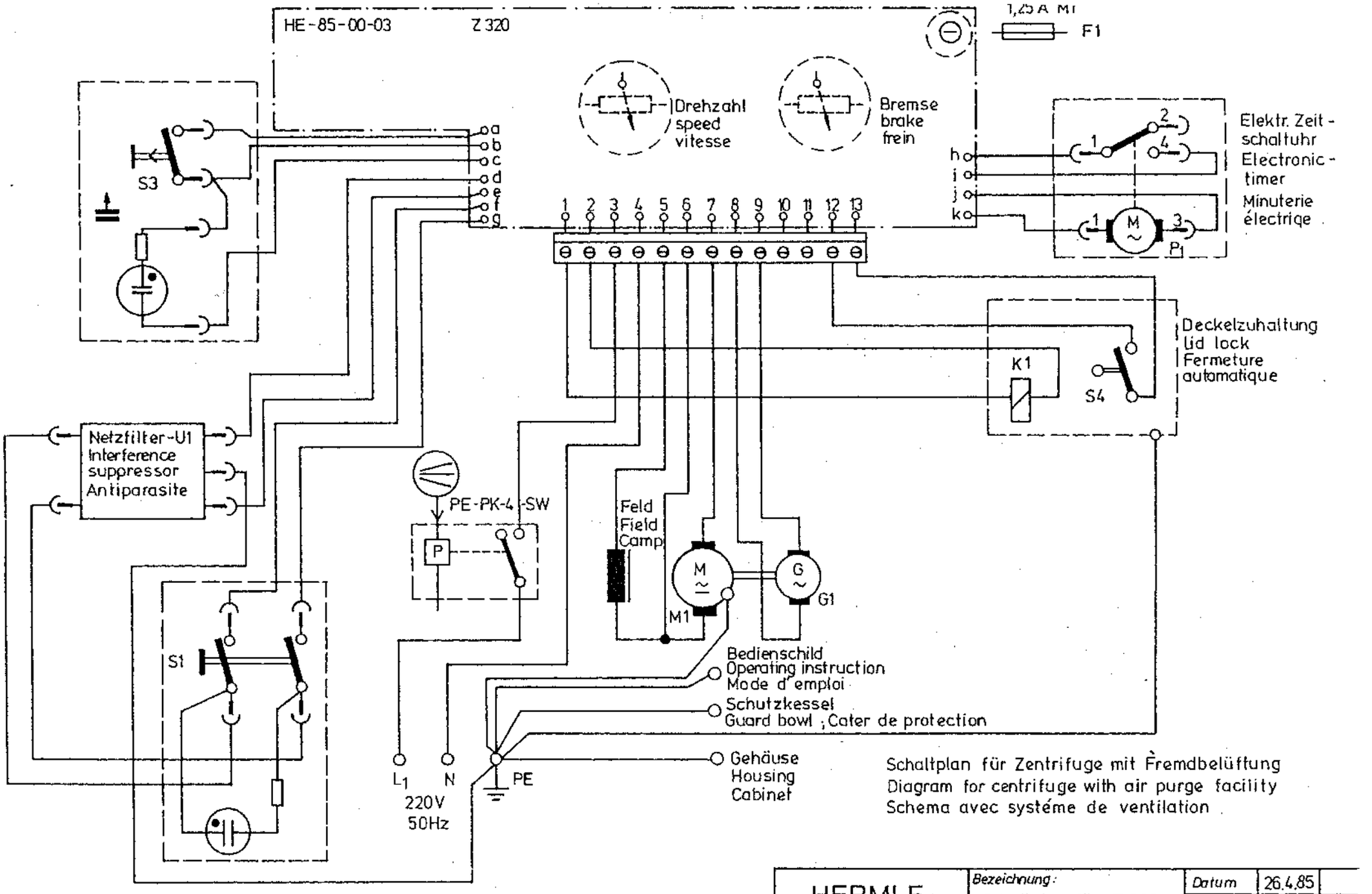
$$g = 11.18 \times r \times \left(\frac{n}{1000}\right)^2$$

g = relative centrifugal force (RCF), i.e relative to the acceleration of the earth which has the constant value g = 9.81 m/s^2

r = spinning radius in cm

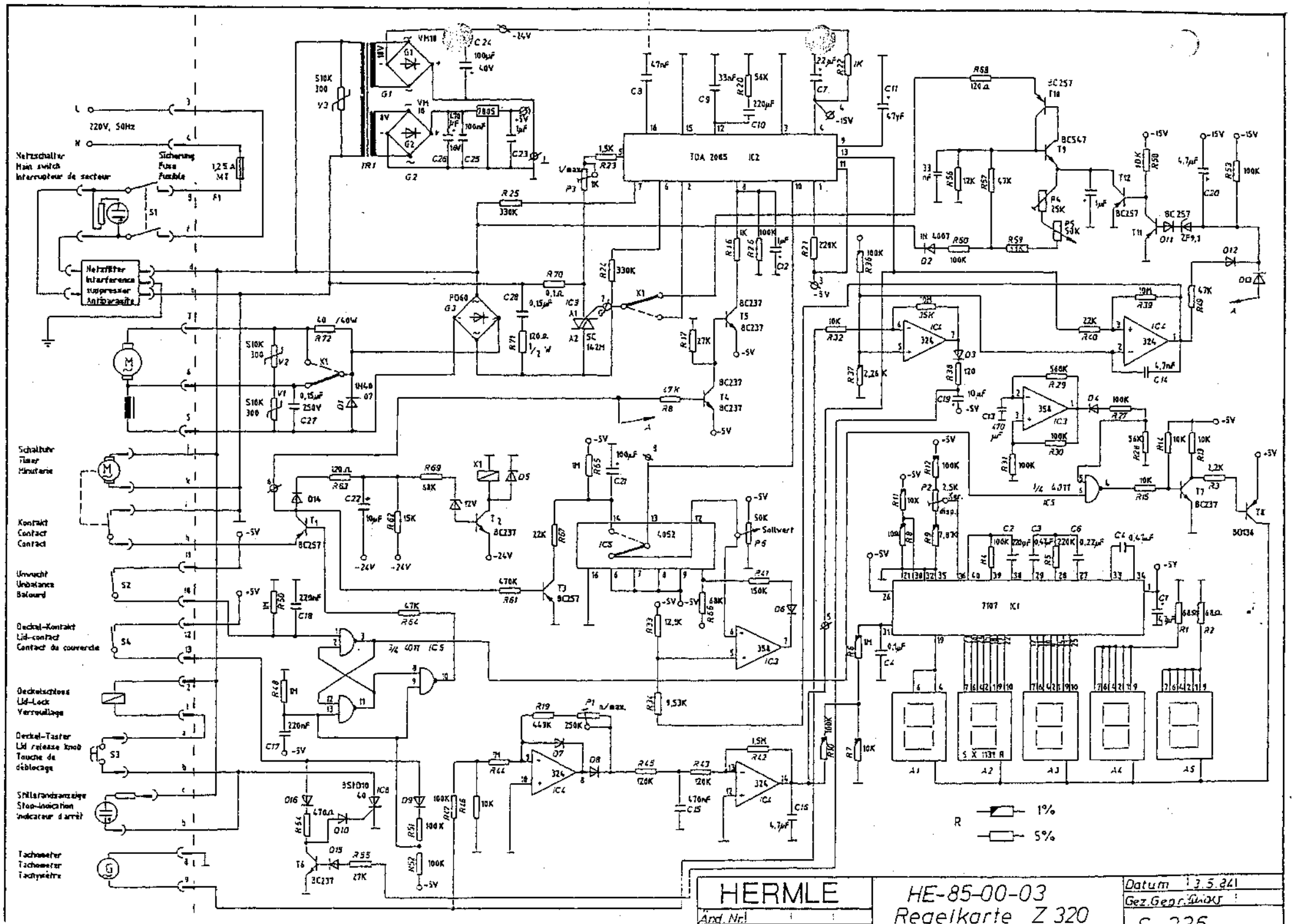
n = revolutions per minute (RPM)

9.2 Circuit diagram



Schaltplan für Zentrifuge mit Fremdbelüftung
Diagram for centrifuge with air purge facility
Schema avec système de ventilation

HERMLE		Bezeichnung: Schaltplan für Z 320 Circuit diagram Z 320 Circuit pour Z 320	Datum 26.4.85
Änd. Nr.			Gez. Gepr.
Name			S 242


220V, 50Hz
Netzschalter
Main switch
Interrupteur de secteur
Sicherung
Fuse
Fusible
Netzfilter
Interference suppressor
Antiparasite
TDA 2065 IC2
7805
7107 IC1
4052 IC5
4011 IC5
324 IC4
324 IC3
354 IC3
Schaltuhr
Timer
Minuterie
Kontakt
Contact
Contact
Unwucht
Unbalance
Balourd
Deckel-Kontakt
Lid-contact
Contact de couvercle
Deckelschloss
Lid-Lock
Verrouillage
Deckel-Taster
Lid release knob
Touche de déblocage
Stillstandsanzeige
Stop-indication
Indicateur d'arrêt
Tachometer
Tachometer
Tachymètre
Soll-wert
Soll-wert
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Regelkarte Z 320
Datum 13.5.81
Gez. Gegr.
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